

C-O-N-F-I-D-E-N-T-I-A-L

Approved For Release 2001/08/27 : CIA-RDP79-00798A000400100002-1

[Signature]
8 Apr 74
(DATE)

MEMORANDUM FOR THE RECORD

SUBJECT: Opinion Request - *Microbial Control of Agr Pests*

Attached is self-explanatory material from the Department of State.
May we have your opinion by ASAP.

Please state degree of interest and whether we will receive requirements.

(IMAGE)

COMMENTS:

25X1A DISTRIBUTION:



-051

*info to
O&R defer 051
Ellie
SB
Hme
LES*

*over taken by
"briefing"
packets"
AB*

Microbial Control of Agr Pests

E2 IMPDET
CL BY: 007622

State Dept. declassification & release instructions on file

Approved For Release 2001/08/27 : CIA-RDP79-00798A000400100002-1

microbial control of agr. pests. It
NATIONAL SCIENCE FOUNDATION

Paul J.
→ EUR/SES - Mr. Perdon
FY11

WASHINGTON, D.C. 20550

STATINTL

*you have any comment they would be
needed by Apr. 12.*

March 25, 1974

Ray

Dr. Martin D. Alexander
Department of Agronomy
Cornell University
Ithaca, New York 14850

Dear Dr. Alexander:

Enclosed are copies of the Working Group's Working Plans, Plan of Action, Milestone Charts, and Budgets. (The Budgets do need clarification.) When we meet at the Foundation on Tuesday, April 16 (9:00 a.m. in room 338), we plan to discuss this material and the Russian Working Plans, which we hope to receive before that time. (Only our Working Plans were sent to the USSR Working Group.

All members should be prepared to arrive at definite U. S. positions, and be prepared to determine what our negotiating stance should be for the Joint Meeting of the US/USSR Working Group that we expect will be held in Washington on June 10-12 (first choice), May 6-8 (second choice), or June 24-26 (third choice). We hope to hear from the Russian side soon.

You will be contacted concerning your travel and hotel plans, and it would facilitate matters if you would let me know as soon as possible, if you cannot attend the April 16 meeting.

The signature block below is changed because Art Humphrey decided, that since extensive early planning of the Working Group has been completed, and because of a possible conflict of interest (as Chairman he would be recommending grants to himself), he should not continue to serve as Chairman. Art suggested, and Dr. Stever agreed, that he be made Co-Chairman and that I serve as Chairman. Art will still serve as Coordinator for Instrumentation and Modelling.

Sincerely yours,

J. M. Leise
Chairman
U.S. Working Group on the
Production of Substances by
Microbial Means

Enclosures

Identical Letters sent to the following:
Approved For Release 2001/08/27 : CIA-RDP79-00798A000400100002-1

Dr. Henry Bungay
Vice President for Research & Development
The Worthington Chemical Company
Freehold, New Jersey 07728

Dr. Edmund Field
Consultant
American Oil Company
5719 South Kenwood Avenue
Chicago, Illinois 60637

Dr. Harlyn O. Halvorson
Professor of Molecular Biology
Brandeis University
Waltham, Massachusetts 02154

Dr. William E. Brown
Director, Department of Microbiology
The Squibb Institute of Medical Research
Princeton, New Jersey 08540

Dr. George Tsao
Program Director
Division of Advanced Technology
Applications
National Science Foundation
Washington, D. C. 20550

Dr. Daniel I. C. Wang
Department of Nutrition & Food Science
Massachusetts Institute of Technology
Cambridge, Massachusetts 02139

Dr. Charles Cooney
Department of Nutrition & Food Science
Massachusetts Institute of Technology
Cambridge, Massachusetts 02139

Copies of these letters went to:

Dr. Ganley)
Dr. Wald) State Department

Dr. Thomas, OIP

Dr. Arthur M. Heimpel
Plant Protection Institute
Bio-Science Bldg., Room 210
U.S. Department of Agric.
Beltsville, Md. 20704

MICROBIAL CONTROL OF PEST OF AGRICULTURAL CROPS

Purpose

The development of technology to mass produce the Nuclear Polyhedrosis Viruses (NPV) and Granulosis Viruses (GV) in insect cell culture. The insect viruses are among the safest and most effective microbial control agents to control lepidopterous pests of food and fiber crops. Insect viruses can be produced economically only in living insects. The culture of insect cells in artificial media promises a more controlled and better source for producing these viruses.

Problems to be Studied

1. The establishment of lines of cell cultures from insect pests.
2. The development of media to support insect cell cultures and the modification of media to insure maximum virus production.
3. The development of technology to mass produce insect cell lines.
4. The development of techniques to mass-store insect cells.

Forms of Cooperation

Development and carrying out of the joint research programs.

Exchange of information of the research results.

Exchange of the research personnel involved in joint research programs during the research period.

Planning of symposia and conferences.

Comparisons and discussion of the research results, including publication.

U.S.A.: The National Science Foundation

U.S.S.R.: The Main Board for Microbiological Industry
Council of Ministers of the U.S.S.R.

Program Coordinators

U.S.A. The program coordinators will be appointed one month following the approval of the Record by the Joint Commission.

U.S.S.R. The program coordinators will be appointed one month following the approval of the Record by the Joint Commission.

Suggested Participating Organizations

U.S.S.R.: All-Union Research Institute of Microbiological Means for Plant Protection and Bacterial Preparations; Institute of Microbiology of the Armenian Academy of Sciences; All-Union Institute of Plant Protection of the All-Union Academy of Agricultural Sciences.

U.S.: U. S. academic institutions and research centers will be named one month following approval of this Record by the Joint Commission.

The Program of Cooperation

- 1.1 Collect through surveys and from collaborators strains of milky disease bacteria.
- 1.2 Selection of virulent strains of B. popilliae and other similar bacteria.
- 1.3 Investigate sporulation of B. popilliae, develop appropriate media etc.
- 1.4 Develop technology to scale up fermentation and sporulation to at least pilot plant level.

Expected results:

1. The research described above is expected to lead to the ability to produce sufficient milky disease spores to carry out large scale permanent suppression of scarabaeid pests.
2. The acquisition of the most virulent bacterial pathogen for each insect pest considered.
3. An understanding of the process of multiplication and sporulation by these fastidious bacteria.

4. Development of technology to produce large quantities of milky disease spores.

Immediate Steps

1. Development of a joint research program.
2. Exchange of information and scientists.

MICROBIAL CONTROL OF PESTS OF AGRICULTURAL CROPS

Purpose

Bacterial sporeformers resembling the milky disease organism of the Japanese beetle have been isolated from Scarabaeid larvae (white grubs) on most continents. These bacteria make highly effective, and permanent insect control agents. To date they can only be produced in living insects. Attempts to bring about sporulation in artificial media would make widespread control of white grubs feasible.

Problems to be Studied

1. Establishment of mutual collections of Bacillus popilliae strains and other milky disease bacteria resembling B. popilliae.
2. Develop and conduct surveys for virulent strains of B. popilliae and assays for these strains.
3. Investigate basic principles necessary to sporulate B. popilliae in artificial media.
4. Develop technology to scale up the fermentation and sporulation of B. popilliae on a commercial scale.

Forms of Cooperation

Development and carrying out of the joint research programs.

Exchange of information of the research results.

Exchange of the research personnel involved in joint research programs during the research period.

Exchange of bacterial cultures.

Planning of symposia and conferences.

Comparisons and discussion of the research results, including publication.

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Responsible Organizations

U.S.A.: The National Science Foundation

U.S.S.R.: The Main Board for Microbiological Industry
Council of Ministers of the U.S.S.R.

Program Coordinators

U.S.A. The program coordinators will be appointed one month following the approval of the Record by the Joint Commission.

U.S.S.R. The program coordinators will be appointed one month following the approval of the Record by the Joint Commission.

Suggested Participating Organizations

U.S.S.R. Microbiology and Virology Institute, U.S.S.R., Academy of Science Kiev; Institute of Microbiology of the Armenian Academy of Sciences; All-Union Institute of Plant Protection of the All-Union Academy of Agriculture Sciences.

U. S. U. S. academic institutions and research centers will be named one month following approval of this Record by the Joint Commission.

The Program of Cooperation

1. The development and exchange of cell lines from lepidopterous pests.
 - 1.1 The investigation of cell requirements, a) for good insect cell growth, b) for good virus production. Determine the least expensive effective media.
 - 1.2 The development of modified equipment to grow insect cells in maximum number per unit volume of media.
 - 1.3 Investigation of cell storage technology.

Expected results:

1. The acquisition of cell lines. Selected or adopted to the purpose of mass producing virus.
2. An intimate and better knowledge of insect cell requirements which should permit the devising of an economical, mass-culture media.
3. The development of equipment suitable for insect cell production and mass virus production.

Page 3

4. The technique of freezing and storage of insect cell inocula for mass cell production.

Immediate Steps

1. Development of a joint research program.
2. Exchange of information and scientists.

CONFIDENTIAL

USAF POSITION ON COMMUNIST BLOC VISITORS

Visitors: Microbiology Bilateral

Project and Sponsor:

LGZ	AFSC	FTD	Other AFSCs
	N/O	N/O	1

8. USAF also provides the following:

• Opinion # 27-3 Due 23 Apr 74

Passed to IIAGE 24 Apr 74

Classified by CIA/IIAGE
 EXEMPT FROM GENERAL DECLASSIFICATION
 SCHEDULE OF EXECUTIVE ORDER 11652
 EXEMPTION CATEGORY 2
 DECLASSIFY ON Indy

CONFIDENTIAL

23 Sept 1976

all carded.
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PROJECT NO. 1

WORKING PROGRAM and Utilization of Food and Feed Proteins by Microbial
Means, Including Research into Different Aspects of Toxicity
Development of Technology for Industrial Production of Such Products

PROJECT TITLE and Biological Value of Such ProductsPROJECT COORDINATOR Dr. Gregorian, U.S.S.R. and Dr. Daniel I.C. Wang, M.I.T., U.S.A

TASK NUMBER	NAME OF TASK OR SUB-TASK	NAME OF PARTICIPANTS AND COOPERATING INSTITUTIONS U.S.S.R.	DATE AND DURATION OF TASK	FORMS OF COOPERATION	EXPECTED RESULTS
2A	ARRANGE WORK-SHOP MEETINGS ON SINGLE-CELL PROTEIN RESEARCH (PART A)				
	TOTAL: 20 U.S. PART. AND 6 U.S.S.R. PART				
	DURATION: 3 DAYS				
2.1	Biological Value and Toxicity	Exchange of Publications Gregorian D.I.C. Wang M.I.T.	July, 1974 and continuing	Exchange of Publications and Conference Reports	Establish and Continue Basis of Communication
		V. Young, M.I.T. N. Scrimshaw, M.I.T. B. Oser, F & D Res. Lab. D. Calloway, U. Cal	Fall, 1974	Meet in U.S.A.	Planning, Initiating and Reporting on Cooperative Program
2.2	Selection of Microbe- Substrate Systems	D.I.C. Wang, M.I.T. C.L. Cooney, M.I.T. C. Dunlap, U. Missouri A. Laskin, Esso C. Wilke, U. Calif. J. Litchfield, Battelle E. Field, Std. Ind. A. Humphrey, U. of Pa. G. Tsao, N.S.F.	Fall, 1974	Meet in U.S.A.	"
2.3	Single-Cell Protein For Food	S.R. Tannenbaum, M.I.T. C.C. McDonald, DuPont C. Atkins, Std. Ind. C. Rha, M.I.T. M. Milner, UN (PAG) T. Labuza, Univ. Minn.	Fall, 1974	Meet in U.S.A.	"
2.4	Methods of Decreasing Nucleic Acid Content	A.J. Sinskey, M.I.T. S.R. Tannenbaum, M.I.T.	Fall, 1974	Meet in U.S.A.	"

WORKING PROGRAM Development of Technology for Industrial Production and Utilization of Food and Feed Proteins by Microbial

PROJECT NO. 1

PROJECT TITLE Means, Including Research into Different Aspects of Toxicity and Biological Value of Such Products

PROJECT COORDINATOR Dr. Gregorian, U.S.S.R. and Dr. Daniel I.C. Wang, M.I.T., U.S.A.

TASK
NUMBER

NAME OF TASK OR SUB-TASK	NAME OF PARTICIPANTS AND COOPERATING INSTITUTIONS U.S.S.R. U.S.	DATE AND DURATION OF TASK	FORMS OF COOPERATION	EXPECTED RESULTS
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2B

ARRANGE WORK-SHOP MEETINGS ON SINGLE-CELL PROTEIN RESEARCH (PART 2)

TOTAL: 20 U.S.S.R. PART & 6 U.S. PART

DURATION: 3 DAYS

2.1 Biological Value and Toxicity

N.S. Scrimshaw, M.I.T. Fall, 1975

Meet in U.S.S.R.

Planning, Implementing, and Reporting on Cooperative Program

2.2 Selection of Microbe-Substrate Systems

D.I.C. Wang, M.I.T.
E. Field, Std. Ind.

Fall, 1975

Meet in U.S.S.R.

"

2.3 Single-Cell Protein for Food

C. Rha, M.I.T.
M. Milner, UN (PAG)

Fall, 1975

Meet in U.S.S.R.

"

2.4 Methods for Decreasing Nucleic Acid Content

S.R. Tannenbaum, M.I.T.

Fall, 1975

Meet in U.S.S.R.

"

PROJECT NO. 1

WORKING PROGRAM Development of technology for industrial production and utilization of food and feed proteins by microbial means, including research into different aspects of toxicology and biological value of such products

PROJECT COORDINATOR Dr. Gregorian and Dr. Wang

TASK NUMBER

NAME OF TASK OR SUB-TASK

NAME OF PARTICIPANTS AND COOPERATING INSTITUTIONS

U.S.S.R.

U.S.

DATE AND DURATION OF TASK

FORMS OF COOPERATION

EXPECTED RESULTS

CHOICE AND SELECTION OF MICROORGANISMS

WORKING PROGRAM OF SIX PROBLEM TOPICS

3.1 Selection of Bacterial and Yeast Culture

R. Donovick, ATCC
NRRL Cult. Coll.
G. Silverman, U.S.
Natick
M.I.T.
Univ. of Wis.
L.S.U.

Fall, 1974 and Continuing

Microbial Culture Exchange
Establish and Broaden Existing Cultures

3.2 Regulation and Control Amino Acid Content of SCP

A.L. Demain, M.I.T.
S.R. Tannenbaum, M.I.T.

Fall, 1974 1 Day and Continuing

Meet in U.S.A. Review Past Progress
Exchange of Existing Research Results
Exchange of Existing Techniques

RAW MATERIAL AND ECONOMIC ANALYSIS OF SCP PRODUCTION

4.1 Cultivation of Yeast on Molasses, Ethanol, Methanol, Hydrocarbons, With Techno-Economic Analysis

D.I.C. Wang, M.I.T.
(Hydrocarbons)
C.L. Cooney, M.I.T.
(Methanol)
A.E. Humphrey U. of Pa.
(Molasses)

Two Years
(1974-1976)
Two Years
(1974-1976)
Two Years (1974-76)
(U. of Pa.)

Exchange of Reports
Forecast and Specify Economically feasible substrates for SCP Production

4.2 Cultivation of Bacteria on Methanol, Ethanol, Agricultural

C. Dunlap, U. Missouri
(Cellulose)

Two Years
(1974-1976)
U. of Missouri

Exchange of Reports

"

4.3 Comparison of Basic Variables & Choice of Substrate

M.I.T.
U. of Pa.
U. Missouri

One Week Fall, 1975

Conference to Discuss Progress, Analysis of Results From 4.1 & 4.2 at M.I.T.
USA- 5 USA Part.
5 USSR Part.

PROJECT NO. 1

WORKING PROGRAM Development of Technology for Industrial Production
and Utilization of Food and Feed Proteins by Microbial
Means, Including Research into Different Aspects of
PROJECT TITLE Toxicity and Biological Value of Such Products

PROJECT COORDINATOR Dr. Gregorian and Dr. Wang, M.I.T.TASK
NUMBERNAME OF
TASK OR
SUB-TASKNAME OF PARTICIPANTS
AND COOPERATING INSTITUTIONS
U.S.S.R. U.S.DATE AND
DURATION OF
TASKFORMS OF
COOPERATIONEXPECTED
RESULTS

DEVELOPMENT OF METHODS FOR PROTEIN ISOLATION FROM UNICELLULAR MICROORGANISMS

5.1 Development of
Enzymatic & Mechanical Methods of Protein
ReleaseD.I.C. Wang, M.I.T.
(Release)Two Years
(1974-1976)Exchange of Research
ReportInformation Exchange
change to Establish
Technical and
Economic Feasibilities5.2 Development of Techniques
For Reduction of Nucleic Acids
By Enzymatic & Physico-
Chemical MeansA.J. Sinskey, M.I.T.
S.R. Tannenbaum, M.I.T.Two Years
(1974-1976)

Exchange of Research

Information Exchange
and Establish
Technical and
Economic Feasibilities

DEVELOPMENT OF INDUSTRIAL METHODS OF BIOMASS PRODUCTION

6.1 Fermentor Apparatus
Design & Scale-up

D.I.C. Wang, M.I.T.

Two Years
(1974-1976)

Exchange of Reports

Establish Report
on Fermentor
Design Most Optimal
for SCP Cultivation

6.2 Biomass Recovery

D.I.C. Wang, M.I.T.

Two Years
(1974-1976)

Exchange of Reports

Define Process
Parameters for Most
Economic Means
of Biomass Recovery6.3 Purifying &
Drying

T. Labuza, U. Minn.

Two Years
(1974-1976)

Exchange of Reports

Establish & Process

6.4 Elaboration on Increased
Capacity (Scale-up) For
Biomass Purification and
Production; Overall Process
Evaluation; Economic AnalysisD.I.C. Wang, M.I.T.
T. Labuza, U. Minn.2 Months
Fall, 1977Work-shop with
Specific Processes
5 US Part.; 5 USSR
Part. Meet in USSREstablish Techno-
Economic Basis for
Scale-up of Biomass
Purification &
Production

PROJECT NO. 1

WORKING PROGRAM Development of a comprehensive, long-term program for the utilization of food and feed proteins by Microbial Means Including Research into Different Aspects of Toxicity
PROJECT TITLE and Biological Value of Such Products

PROJECT COORDINATOR Dr. Gregorian, U.S.S.R. and Dr. Daniel I.C. Wang, M.I.T.

<u>TASK NUMBER</u>	<u>NAME OF TASK OR SUB-TASK</u>	<u>NAME OF PARTICIPANTS AND COOPERATING INSTITUTIONS</u> U.S.S.R. U.S.	<u>DATE AND DURATION OF TASK</u>	<u>FORMS OF COOPERATION</u>	<u>EXPECTED RESULTS</u>
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SPECIAL TREATMENT OF BIOMASS AND ISOLATED PROTEIN THEREFROM FOR USE IN PREPARATION OF FOODS

7.1	Protein Isolation, Characterization of SCP	C. Rha, M.I.T.	Two Years (1975-1977)	Exchange of Research Reports	Definition of Protein Isolation & Characterization of Isolated SCP
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7.2	Protein Utilization in Preparation of Foods	T. Labuza, U. Minn.	Two Years (1975-1977)	Exchange of Research Reports	Establish Protocol & Potential Routes of Prepared Foods From SCP
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BIOLOGICAL VALUE AND TOXICITY

A.A. Pokrovsky , Nutrition Institute	N.S. Scrimshaw, M.I.T.	Three Years (1974-1977)	Exchange of Reports	Establish Safety of SCP
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FIRST PRIORITY

BUDGET TIMING OVER FIVE YEARS

Project No. 1

Task No.	1st Year	2nd Year	3rd Year	4th Year	5th Year	Subtotal for 5 Years
1	\$500	0	0	0	0	\$500
2A	\$5000	0	0	0	0	\$5000
2B	0	0	0	0	0	0
3.2	1000	-	-	-	-	\$1000
4.1	25,000	25,000	-	-	-	50,000
4.2	25,000	25,000	-	-	-	50,000
5.1	20,000	10,000	-	-	-	30,000
5.2	20,000	10,000	-	-	-	30,000
6.1	30,000	20,000	-	-	-	50,000
6.2	-	-	-	-	-	0
6.3	-	-	-	-	-	0
6.4	-	-	-	-	-	0
7.1	-	-	-	-	-	0
7.2	-	-	-	-	-	0
8	20,000	20,000	-	-	-	40,000
Total	\$146,500	\$110,000	0	0	0	\$256,500

BUDGET TIMING OVER FIVE YEARS

Project No. 1

SECOND PRIORITY

Task No.	1st Year	2nd Year	3rd Year	4th Year	5th Year	Subtotal for 5 Years
1	\$1000	\$500	\$500	-	-	\$2000
2A	\$9000	-	-	-	-	\$9000
2B	-	\$9000	-	-	-	\$9000
3.2	\$1000	-	-	-	-	\$1000
4.1	\$55,000	\$55,000	-	-	-	\$110,000
4.2	\$55,000	\$55,000	-	-	-	\$110,000
4.3	-	\$2000	-	-	-	\$2000
5.1	\$35,000	\$45,000	-	-	-	\$80,000
5.2	\$30,000	\$50,000	-	-	-	\$80,000
6.1	\$45,000	\$55,000	-	-	-	\$100,000
6.2	\$40,000	\$40,000	-	-	-	\$80,000
6.3	\$45,000	\$55,000	-	-	-	\$100,000
6.4	-	-	\$20,000	-	-	\$20,000
7.1	-	\$40,000	\$40,000	-	-	\$80,000
7.2	-	\$40,000	\$40,000	-	-	\$80,000
8	\$50,000	\$50,000	\$50,000	-	-	\$150,000
Total	\$366,000	\$496,500	\$155,500	-	-	\$1,013,000

BUDGET TIMING OVER FIVE YEARS

Project No. 1

THIRD PRIORITY

Task No.	1st Year	2nd Year	3rd Year	4th Year	5th Year	Subtotal for 5 Years
1	\$1000	\$500	\$500	-	-	\$2000
2A	\$9000	-	-	-	-	\$9000
2B	-	\$9000	-	-	-	\$9000
3.2	\$1000	-	-	-	-	\$1000
4.1	\$100,000	\$100,000	\$50,000	-	-	\$250,000
4.2	\$100,000	\$100,000	\$50,000	-	-	\$250,000
4.3	-	\$2000	-	-	-	\$2000
5.1	\$60,000	\$70,000	\$30,000	-	-	\$160,000
5.2	\$40,000	\$50,000	\$30,000	-	-	\$120,000
6.1	\$50,000	\$60,000	\$150,000	-	-	\$250,000
6.2	\$40,000	\$50,000	\$10,000	-	-	\$100,000
6.3	\$80,000	\$80,000	\$40,000	-	-	\$200,000
6.4	-	-	\$35,000	-	-	\$35,000
7.1	-	\$40,000	\$40,000	-	-	\$80,000
7.2	-	\$40,000	\$40,000	-	-	\$80,000
8	\$50,000	\$70,000	\$110,000	\$110,000	\$120,000	\$450,000
Total	\$531,000	\$671,500	\$565,500	\$110,000	\$120,000	\$1,998,000

TOTAL BUDGET ESTIMATE
FIVE YEARS WITH PRIORITY

Development of Technology for Industrial Production and Utilization of Food and Feed
Proteins by Microbial Means, Including Research Into Different Aspects of Toxicity
and Biological Value

Task Number	Type of Task	Starting Date	Duration of Task	First Priority Estimated Budget (\$)	Second Priority Estimated Budget (\$)	Third Priority Estimated Budget (\$)
1	Clerical	July, 1974	5 Years	\$500	\$2000	\$2000
2A	Conference	July, 1974	3 Days	\$5000	\$9000	\$9000
2B	Conference	Sept., 1974	3 Days	--	\$9000	\$9000
3.2	Conference	Sept., 1974	1 Day	\$1000	\$1000	\$1000
4.1	Res. & Dev.	July, 1974	2 to 3 Years	\$50,000	\$110,000	\$250,000
4.2	Res. & Dev.	July, 1974	2 to 3 Years	\$50,000	\$110,000	\$250,000
4.3	Conference	Sept., 1975	1 Week	--	\$2000	\$2000
5.1	Res. & Dev.	July, 1974	2 to 3 Years	\$30,000	\$80,000	\$160,000
5.2	Res. & Dev.	July, 1974	2 to 3 Years	\$30,000	\$80,000	\$120,000
6.1	Res. & Dev.	July, 1974	2 to 4 Years	\$50,000	\$100,000	\$250,000
6.2	Res. & Dev.	July, 1974	2 to 3 Years	--	\$80,000	\$100,000
6.3	Res. & Dev.	July, 1974	2 to 3 Years	--	\$100,000	\$200,000
6.4	Workshop	Sept., 1974	2 Months	--	\$20,000	\$35,000
7.1	Res. & Dev.	July, 1975	2 to 3 Years	--	\$80,000	\$80,000
7.2	Res. & Dev.	July, 1975	2 to 3 Years	--	\$80,000	\$80,000
8	Res. & Dev.	July, 1974	3 to 5 Years	\$40,000	\$150,000	\$450,000

TOTAL FOR FIVE YEARS

\$256,500 \$1,013,000 \$1,998,000
(1st Priority) (2nd Priority) (3rd Priority)

WORKING PROGRAM

Project No. 2

PROJECT TITLE:

Engineering Research and Development of Equipment and Methods for the Computerized Simulation, Design and Control of Processes for Microbial Technology

PROJECT COORDINATORS:

Dr. Shamil Yenikeyev, Kazan Institute Chemical Technology
Dr. Arthur Humphrey, University of Pennsylvania

NAME OF TASK OR SUB-TASK	NAME OF PARTICIPANTS AND COOPERATING INSTITUTIONS	DATE AND DURATION OF TASK	FORMS OF COOPERATION	EXPECTED RESULTS
Development of techniques and new sensors for measuring the significant variables in microbial processes and assembling equipment for experimental investigations.				
1 Conference and position paper on needed instrumentation	Yenikeyev Kazan Inst. Chem. Tech.	Humphrey Univ. of Penna.	one week summer 1974	conference at Univ. of Penna. 5 USSR part. 5 US part. needed instrumentation
2 Development of Instrumentation relative to measurement of biomass (including computer interface & software)	_____	Humphrey Univ. of Penna.	two years 1974-1976	exchange of research reports two man years
3 Development of Instrumentation relative to measurement of microbial activity (including interface & software)	_____	Humphrey Univ. of Penna.	two years 1974-1976	exchange of research reports two man years
1.4 Development of Instrumentation relative to measurement of system dispersion (including interface & software)	Yenikeyev Kazan Inst. Chem. Tech.	_____	two years 1974-1976	exchange of research reports equipment & theory development

WORKING PROGRAM

Project No. 2

PROJECT TITLE: Engineering Research and Development of Equipment and Methods for the Computerized Stimulation, Design and Control of Processes for Microbial Technology

PROJECT COORDINATORS: Dr. Shamil Yenikev, Kazan Institute Chemical Technology
Dr. Arthur Humphrey, University of Pennsylvania

NUMBER	NAME OF TASK OR SUB-TASK	NAME OF PARTICIPANTS AND COOPERATING INSTITUTIONS	DATE AND DURATION OF TASK	FORMS OF COOPERATION	EXPECTED RESULTS
1	Investigation of momentum, heat, and mass transfer in heterogeneous gas-liquid-liquid type of culture condition	? Inst. Protein Synth. USSR	one week fall 1974	conference at Inst. Prot. Synth. Moscow, USSR 5 USSR part. 5 US. part.	Report on status & the study of HC uptake by micro-robots
2	Development of hydro-dynamical theory for heterogeneous gas-liquid-liquid microbial culture	Erickson Kansas State Univ.	two years 1974-1976	exchange of research reports	theory development
3	Development of experimental apparatus and taking of data for creation of a hydro-dynamical model of the heterogeneous gas-liquid-liquid fermentation system	Yenikev Kazan Inst. Chem. Tech.	two years 1974-1976	exchange of research results	equipment development

WORKING PROGRAM

Project No. 2

PROJECT TITLE:

Engineering Research and Development of Equipment and Methods for the Computerized Simulation, Design and Control of Processes for Microbial Technology

PROJECT COORDINATORS:

Dr. Shamil Yenkeyev, Kazan Institute Chemical Technology
Dr. Arthur Humphrey, University of Pennsylvania

NUMBER	NAME OF TASK OR SUB-TASK	NAME OF PARTICIPANTS AND COOPERATING INSTITUTIONS	DATE AND DURATION OF TASK	FORMS OF COOPERATION	EXPECTED RESULTS
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Research on microbial population dynamics of heterogeneous systems

1. Development of a kinetic theory for behavior of microbes in a heterogeneous system

Erickson
Kansas
State Univ.

two years
1974-1976

exchange of
research
reports

model development

2. Development of experimental apparatus and taking of data for creation of a model for microbial population behavior in a heterogeneous system

Yenkeyev
Kazan Inst.
Chem. Tech.

two years
1974-1976

exchange of
research
reports

creation of a model for computer control appl

3. Conference to integrate results of tasks 1, 2 and 3 and to assist in the design of the experimental demonstration unit (at Inst. Protein Synth.)

?
Inst. Prot.
Synthesis
Yenkeyev
Kazan Inst.
Chem. Tech.

Humphrey
Univ. of
Penna.
Erickson
Kansas
State Univ.

one month
summer
1976

working
conf. on
equip.
design

equipment design & specification

WORKING PROGRAM

Project No. 2

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PROJECT COORDINATORS:

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TASK NUMBER	NAME OF TASK OR SUB-TASK	NAME OF PARTICIPANTS AND COOPERATING INSTITUTIONS	DATE AND DURATION OF TASK	FORMS OF COOPERATION	EXPECTED RESULTS
		U.S.S.R.	U.S.		

Development of Engineering techniques for optimal design of industrial scale fermentor and automatic control of industrial fermentation processes

Exchange visits in order to coordinate the plans for the computer coupled fermentation control systems

Yenikev
Kazan Inst.
Chem. Tech.

Humphrey
Univ. of Penna.
Cooney-Mass. Inst. Tech.
Jefferys
Widener College

two men (each side) exchange visits one at post-doctoral level for one year, one at faculty level for three months

exchange visits

information exchange

Investigation on both the theoretical and practical aspects of computer control of fermentation systems

Yenikev
Kazan Inst.
Chem. Tech.

Cooney-Mass. Inst. Tech.
Humphrey Univ. of Penna.

1974-1976 two men years of results M.I.T. one man year U. of P.

exchange of results and experience

knowledge in computer control systems plus software development

WORKING PROGRAM

Project No.2

PROJECT TITLE:

Engineering Research and Development of Equipment and Methods for the Computerized Simulation, Design and Control of Processes for Microbial Technology

PROJECT COORDINATORS:

Dr. Shamil Yenikev, Kazan Institute Chemical Technology
Dr. Arthur Humphrey, University of Pennsylvania

TASK NUMBER	NAME OF TASK OR SUB-TASK	NAME OF PARTICIPANTS AND COOPERATING INSTITUTIONS	DATE AND DURATION OF TASK	FORMS OF COOPERATION	EXPECTED RESULTS
3	Investigation of both the theoretical and practical aspects of computer control of fermentation systems	Yenikev-Kazan Inst. Chem.Tech.	Coony-M.I.T. 1974-1976 Humphrey-U. of Penn. M.I.T. one man year U. of P.	exchange of results and experience	knowledge in computer control systems plus software development
4	Design and demonstration of practical system for computer control of the production of single cell protein from hydrocarbon substrates				
5.1	Conference to coordinate total design information	Yenikev-Kazan Inst. Chem.Tech. ? Inst.Protein Synth.	Humphrey-U. of P. Fall 1976 Erickson-Kansas State U. Cooney-M.I.T. Jefferys-Widener Univ.	conference with key people in attendance approx.5 from each side	specificity of final design & trials runs
5.2	Design and Construction of the computer controlled fermentation unit	Inst. Protein Synth.	----- one year 1976-1977	Consultation on design and construction	optimally designed practical computer controlled fermentor

WORKING PROGRAM

Project No. 2

PROJECT TITLE:

Engineering Research and Development of Equipment and Methods for the Computerized Simulation, Design and Control of Processes for Microbial Technology

PROJECT COORDINATORS:

Dr. Shamil Yenikev, Kazan Institute Chemical Technology
Dr. Arthur Humphrey, University of Pennsylvania

TASK NUMBER	NAME OF TASK OR SUB-TASK	NAME OF PARTICIPANTS AND COOPERATING INSTITUTIONS	DATE AND DURATION OF TASK	FORMS OF COOPERATION	EXPECTED RESULTS
5.	Demonstration of optimal control of SCP fermentation through use of computer	? at appropriate site in USSR	Summer 1978	Consultations	optimal SCP process
6	JOINT WRITING AND PUBLISHING OF BOOK ON	COMPUTER SIMULATION, DESIGN & CONTROL OF FERMENTATION SYSTEMS			
6.1	Meetings to plan & outline joint book	Yenikev- Kazan Inst.Chem. Tech.	Humphrey- U. of P.	Summer 1974 in connection with task 1.1	Planning of joint book Book outline & chapter assignments
6.2	Writing of individual Chapters	Yenikev- Kazan Inst.Chem. Inst.	Humphrey- U. of P.	1974-1976	Exchange and criticism of Chapters Book manuscript
6.3	Editing and Publishing of Book	Yenikev- Kazan Inst.Chem. Inst.	Humphrey- U. of P.	1976	Editing book in both Russian and English Jointly Published Book

TOTAL BUDGET ESTIMATE

FIVE YEAR PLANNING FOR
PROJECT NO. 2

"Engineering Research and Development of Equipment and Methods for the Computerized Simulation, Design and Control of Processes for Microbial Technology"

Project Coordinators: Dr. Shamil Yenikev
Dr. Arthur E. Humphrey

<u>Task No.</u>	<u>Type of Task</u>	<u>Starting Date</u>	<u>Duration</u>	<u>1st</u> <u>Priority</u>	<u>2nd</u> <u>Priority</u>	<u>3rd</u> <u>Priority</u>
1.1	Conference	July 1974	1 week	10,000		
1.2	Research	July 1974	2 yrs.	130,000		
1.3	Research	July 1974	2 yrs.			
1.4	Research	July 1974	2 yrs.	USSR		
2.1	Conference	Sept. 1974	1 week	5,000		
2.2	Research	Jan. 1974	2 yrs.		65,000	
2.3	Research	Jan. 1974	2 yrs.	USSR		
3.1	Research	Jan. 1974	2 yrs.		65,000	
3.2	Research	Jan. 1974	2 yrs.	USSR		
3.3	Conference	July 1976	1 mo.	10,000		
4.1	2 Exchange Visits	1975-1976	1 yr.		24,000	
4.2	Research	July 1974	2 yrs.	180,000		180,000
4.3	Research	July 1974	2 yrs.		180,000	180,000
5.1	Conference	Fall 1976	2 weeks	10,000		
5.2	Research (consultation)	July 1976	1 yr.	USSR	5,000	
5.3	Consultation	Summer 1977	3 mos.	USSR	10,000	
6.1	Conference	Fall 1974	2 weeks			10,000
6.2	Conference & Consultation	Fall 1974	2 yrs.			50,000
6.3	Consultation & Publishing	Summer 1976	3 mos.			10,000
				345,000.	349,000.	430,000.
CUMULATIVE TOTALS				345,000.	694,000.	1,124,000.

PROJECT TITLE Genetics of Industrial Microorganisms

PROJECT COORDINATOR ^{H.O.} J. Alverson and W. B. Rowell

Development of genetic methods for improving industrial microorganisms
Lead in approach of molecular Biology.
11.1. confidence to develop plans on genetics of nonantibiotic producing cultures

Paula Helen
Bendlin Univ
Washington, Mass

1-2 days
1975 edition with
ASMA on GSA
annual meeting

conference
5- USR part.
5- USA part.

design of projects

1.2. Conference to develop plans on the growth of antibiotic producing actinobacteria
G. I. Gaur

G.I. Ginner
Institute of
Antibiotics, Moscow

A. Damsin 711, 17, 130, 100

2-3 days

Confusion

design project

John J. Leavelle
Institute of Earth Sciences
Lamont

School of Pharmacy
Univ. of Wisc, Madison

W, E, Brown

S. Marbilia

Squibb & Co

Institute of
Economics

Dr. Bailey
Medical College of Va

113. Genetics of antibiotic production

1000 1.03

22/10/20

3 years
1971-8

increase
production of
Griffiths

1.4 Development of improved methods for cellulose utilization

7. Enoki

M. handelii

•

24ms
1975-6

3 man years USR
3 mm glass USA

increase
production of
Griffiths

exchange funds,
studies,
3 men from USA
2 men from USSR
at Port De Lyl

engineering
and production
and fermentation
technology

WORKING PROGRAM

PROJECT NO. 3

PROJECT TITLE Genetics of Industrial Microorganisms

PROJECT COORDINATOR H.O. Halvorson and K. Brown

<u>TASK OR SUB-TASK</u>	<u>NAME OF PARTICIPANTS AND COOPERATING INSTITUTIONS</u> U.S.S.R. U.S.	<u>DATE AND DURATION OF TASK</u>	<u>FORMS OF COOPERATION</u>	<u>EXPECTED RESULTS</u>
<u>1/6</u>	<u>Genetics of non antibiotic producing cultures</u> <u>See 1/1</u>	<u>2-3 years</u> <u>starting 1975-6</u>	<u>Specialized</u> <u>genetics</u> <u>exchange of</u> <u>information</u>	<u>Coordination of</u> <u>research</u> <u>Increased</u> <u>yields</u>
<u>1/7</u>	<u>Use of genetic engineering and molecular biology for strain development</u> <u>See 1/1</u> <u>participants to be selected</u> <u>V.I. Knyazov</u> <u>Institute of Genetic and Selection of industrial microorganisms, Moscow</u> <u>P. Beng</u> <u>Stanford</u> <u>P. Mensink</u> <u>Brandeis Univ., Waltham, Mass.</u> <u>R. Schell</u> <u>Brandeis Univ. Waltham, Mass.</u> <u>3 years</u> <u>1976</u> <u>Coordinate</u> <u>research, provide</u> <u>on local food model</u> <u>systems</u> <u>Improved</u> <u>development of</u> <u>adaptive microbial</u> <u>systems for</u> <u>genetic engineering</u>	<u>3-4 years</u> <u>1975-76</u> <u>Strain</u>	<u>conference</u> <u>5 USSR</u> <u>in connection with</u> <u>an international meeting</u>	<u>Exchange of</u> <u>information</u> <u>and approach</u>

WORKING PROGRAM

PROJECT TITLE Genetics of Industrial Microorganisms

2. Development of methods for genetic analysis for insect control.

Research Project
design, exchange of
information

Univ of Missy,
Mississin

Cooperation
Research support
Exchange of postdoctoral
fellows!

**Strive and Ap-
plied
Innovations**

Li Bulla
 USDA Grain
 Marketing Research
 Center, Manhattan
 Kansas
 1 year
 1975 to
 Postdoctoral
 or Senior Scientist
 exchange
 Improved
 toxin production

PROJECT NO. 3

PROJECT TITLE Genetics of Industrial Microorganisms
PROJECT COORDINATOR Dr. J. J. Alvarado and W. Brown

WORKING PROGRAM

TASK NUMBER	NAME OF TASK OR SUB-TASK	NAME OF PARTICIPANTS AND COOPERATING INSTITUTIONS	DATE AND DURATION OF TASK	FORMS OF COOPERATION	EXPECTED RESULTS
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3 Development of genetic methods to improve industrial strains of yeast, including utilization of hydrocarbons, methanol, etc.

3.1 Conference on mutagenesis and recombination in yeast

S. G. Ing-Vestman
Dept. Genetics,
Leningrad Univ.
R. Mortimer
Univ. Calif.,
Berkeley
4-5 days
1975
conference
sponsored
by USA
and USSR

Theory of
mutagenesis as
applied to strain
selection

3.2 Selection of hydrocarbon utilizing yeasts

S. G. Ing-Vestman
Dept. Genetics,
Leningrad Univ.
R. Mortimer
Univ. Calif.,
Berkeley
3 years
1975-8
Research
support
postdoctoral
exchange.

Improved
production of
hydrocarbons utilizing
yeast.

3.3 Improved methods for genetic analysis in yeast.

B. V. Simanov
Dept. Genetics,
Leningrad Univ.
H. A. Halvorsen
Brandeis U.,
Waltham, Mass.
3 years
1975-8
Research
support
postdoctoral
exchange.
V. I. Kozlovskii
Lab. Microorganisms
and Breeding in yeast,
Moscow.
S. H. Baber
Brandeis U.,
Waltham, Mass.

Improved
theory and
methods for
analysis and
speculation.

WORKING PROGRAM
PROJECT TITLE Genetics of Industrial Microorganisms
PROJECT NO. 3
PROJECT COORDINATOR H.O. Halvorson and W. Brown

TASK OR SUB-TASK	NAME OF PARTICIPANTS AND COOPERATING INSTITUTIONS	DATE AND DURATION OF TASK	FORMS OF COOPERATION	EXPECTED RESULTS
4. Development of methods of genetic analysis of microorganisms for the production of amino acids.	U.S.S.R. U.S.			
4.1 construction of genetic strains for amino acid production	M.G. Gerasimov Inst. of Genetics and Acad. of Ind. Microorganisms, Armenia, Soviet Union	3 years 1974-77	cooperative technical support postdoctoral exchange	improved strain development
4.2 Development of testing systems for genetic analysis in <u>Bacillus</u>	V.V. Subbotin Inst. of Genetics and Selection of Microorganisms, Moscow	3 years 1974-75	joint research projects, exchange of personnel	improved genetic system
4.3 Symposium on Genetic Methods Summary of Projects 1-4	F. Young Rochester Medical School Rochester, N.Y.	1 week 1977	Final reports published	Publish Book on cellular

4.

EVENT	EVENT NAME	ESTIMATED COST ¹	PRIORITIES HOH	PRIORITIES WB
1	3rd Meeting Working Group	----	----	----
2	Conference	\$7,000	A	
3	Conference	\$6,000	A	
4	Research Projects	<i>25,000 -</i> \$75,000-\$150,000	A - lowest B Lower middle C Higher <i>+</i>	<i>} w. e/s</i>
5	Research Projects	\$40,000	B	
6	Annual Conference	\$15,000	C	
7	Research Projects	\$75,000-\$150,000	A Lower C Higher	
8	Exchange Personnel	\$75,000	B	
9	Conference	\$7,000	B	
10	Research Projects	\$75,000-\$150,000	B Lower C Higher	
11	Workshop	\$7,000	A	
12	Conference	\$5,000	B	
13	Research Projects	\$75,000-\$150,000	B Lower C Higher	
14	Research Projects	\$20,000	C	
15	Conference	\$5,000	C	
16	Conference	\$5,000	B	
17	Research Projects	\$25,000-\$50,000	B	
18	Research Projects	\$50,000-\$100,000	A Lower C Higher	
19	Exchange Personnel	\$40,000	B	
20	Conference	\$4,000	C	
21	Research Projects	\$25,000-\$50,000	A Lower B Higher	
22	Research Projects	\$50,000-\$100,000	A Lower C Higher	
23	Exchange Personnel	\$40,000	B	
24	Conference	\$4,000	C	
25	Symposium	\$30,000	A	

WORKING PROGRAM

PROJECT TITLE Enzyme Applications

PROJECT COORDINATOR G.T. Tsao (U.S.A.)

I. Berezin and K. Kalumyante (U.S.S.R.)

TASK NUMBER	TASK OR SUBTASK	AND COOPERATING INSTITUTIONS U.S.S.R.	DURATION OF TASK	FORMS OF COOPERATION	EXPECTED RESULTS
	Search and isolation of enzyme producing strains of microorganisms of tissue cultures				
	1.1 Strain selection	Moscow State Univ. N.S.F. Grantees Inst. for Protein Syn. Inst. for Chem. of Natural Prod. Tollin Poly. Inst.	5 yrs.	exchange and testing more productivity to compare strains	
	1.2 Microbial Physiology	same	5 yrs.	joint research projects	more productivity strains
	Commercial isolation and purification of enzymes				
	2.1 Enzyme isolation	same	5 yrs.	joint research projects	
	2.2 Process development	same	5 yrs.	joint research projects	
	2.3 Stabilization of enzymes	same	5 yrs.	joint projects	processes and equipment for enzyme production
	2.4 Equipment design	same	5 yrs.	joint projects	

WORKING PROGRAMS

PROJECT NO. 4

PROJECT TITLE Enzyme Applications

PROJECT COORDINATOR G.T. Tsao, I. Berezin & K.A. Kalunyante

TASK NUMBER	NAME OF TASK OR SUB-TASK	NAME OF PARTICIPANTS AND COOPERATING INSTITUTIONS	DATE AND DURATION OF TASK	FORMS OF COOPERATION	EXPECTED RESULTS
3	Immobilized Enzymes				
	3.1 Theoretical analysis and modelling	Moscow Univ. N.S.F. Grantees	5 yrs.	joint projects	development and understanding of new industrial processes
	3.2 Carrier selection	several institutions	same	5 yrs.	joint projects
	3.3 Multienzyme and/or cofactor systems	same	same	5 yrs.	joint projects
	Diagnostic and Analytical Uses of Immobilized Enzymes				
	4.1 Enzyme-immune essay	NSF Grantees	5 yrs.	joint projects	new diagnostic techniques
	4.2 Enzyme detection of faint light or sound	Moscow Univ. Univ. of Penn. Berrain Graves Others	5 yrs.	joint projects	

WORKING PROGRAMS

PROJECT TITLE Enzyme Applications

PROJECT COORDINATOR G.T. Tsao, I. Berezin & K.A. Kalunyan

TASK NUMBER	NAME OF TASK OR SUB-TASK	NAME OF PARTICIPANTS AND COOPERATING INSTITUTIONS	DATE AND DURATION OF TASK	FORMS OF COOPERATION	EXPECTED RESULTS
	Technology of Enzymatic Cleavages				
5.1	Production of sugar from cellulose	L.S. Losyakova Inst. of Biosyn. of Protein Sub.	Wilke and Bassham U. Cal. Berkeley	5 yrs.	Joint project
5.2	Fermentable sugars from agricultural wastes	L.S. Losyakova	Burnet and Lee	5 yrs.	Joint project
5.3	Enzyme production of milk substitutes			5 yrs.	Joint project
5.4	Cleavage reversal to make peptides and fine chemicals	same	Corning Glass Weetal	5 yrs.	Joint project
	Participation in Polymeric 74 Conference Symposium on Production and Properties of Immobilized Enzymes	Berezin Tsao			

USE OF
ENZYMES IN
AGRICULTURE

PROJECT NO. 4 BUDGET PLAN
FISCAL YEAR

PROJECTS	1974	1975	1976	1977	1978
(1) Polymery 74 Project 4, Task 6	\$10,000				
(2) Fermentable sugar Iowa State Project 4, Task 5.2	\$80,000	100,00	120,000	140,000	160,000
(3) Sagar from cellulose Cal. Berkeley Project 4, Task 5.1	\$80,000	100,000	120,000	140,000	160,000
(4) Acoustic Imaging Project 4, Task 4.2	\$60,000	80,000	100,000	120,000	140,000
(5) First Priority Group	\$230,000	280K	340K	400K	460K
(6) Leavage Reversal orning Glass Project 4, Task 5.4	\$90,000	100K	110K	120K	130K
(7) Project 4, Task 5.3	-----	80K	100K	120K	140K

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